AMENDMENTS TO THE DRAWINGS:

Attached is a replacement drawing sheet for FIG. 4. This sheet replaces the originally filed sheet for FIG. 4.

REMARKS

Claims 1-13 are pending in this application, of which claims 1-3 and 6 have been amended. Claims 7-10 have been withdrawn from consideration. Claims 11-13 are newly-added.

Claims 1-6 stand rejected under 35 U.S.C. § 112, second paragraph, as indefinite.

The Examiner has urged that the meaning of the claimed term "current density" is not clear, because the specification has defined it as "current per unit length of the active layer" and the common definition is "current per unit area." For the definition expressed in the specification to be clearly understood, the Examiner has requested clarification of the orientation of "length of the active layer" and "width of the active layer" in FIG. 1. In particular, the Examiner has stated:

> It is unclear whether the applicant means "length of the active layer" to be in the direction pointing from feature 20A to 20B or feature 8 to 9, similarly it is unclear whether "width of the active layer" to be in the direction pointing from feature 8 to 9 in a direction into the page.

Generally, the technical term "density" includes the following three meanings: volume density, surface density and linear density. The term "current density" in these claims means "current linear density" as understood by the Examiner.

Applicant intends "length of the active layer" to be in the direction pointing from feature 20A to 20B, and means "width of the active layer" to be in a direction into the page.

Accordingly, FIG. 4 has been corrected, and the specification and claims 1-3 and 6 have been amended by changing all instances of "current density" to "current linear density."

The Examiner has also indicated that claims 1 and 6 contain limitations to both the structure of the optical amplifier and the current used to pump the device. The Examiner urges that the limitations directed to the current used to pump the device are improper because the language is such that one or ordinary skill in the art would not be able to determine the metes and bounds of the claimed invention. The Examiner has stated:

> For example, the potential infringer would have to measure the gain response for the amplifier as a function of the current applied (normalized for the dimensions of the device) and then decide how best to attribute the gain measured to the different relaxation states enumerated in [0067] - [0070], plot the response curves (in a manner that may or may not be the same as that of the applicant), determine the crossing points of these response curves and then see if the currents they applied are higher or lower than the abscissas of given "cross points." Furthermore, the issue of uncertainties has not been mentioned. Would one skilled in the art be infringing if the applicant's "critical abscissa" were within the error bars of the competitor, or if the competitor's "critical abscissa" were within the error bars of the applicant? For these reasons, claims 1, 2 and 6 are held to be indefinite.

Accordingly, claims 1 and 6 have been amended to change the current pumping limitations which attempt to clarify the metes and bounds of these claims. If these proposed amendments are not acceptable to the Examiner, the undersigned respectfully requests that the Examiner contact the undersigned to schedule an interview to determine how they may be properly amended to eliminate any remaining indefiniteness.

Claims 1 and 3 stand rejected under 35 U.S.C. § 102(b) as anticipated by any one of U.S. Patent 5,946,336 to Mizutani et al. (hereafter, "**Mizutani et al.**"); U.S. Patent 5,793,521 to O'Brien et al. (hereafter, "**O'Brien et al.**"); U.S. Patent 5,608,572 to Nitta et al. (hereafter, "**Nitta et al.**"); or U.S. Patent 5,224,114 to Ikeda et al. (hereafter, "**Ikeda et al.**").

Applicant respectfully traverses this rejection.

Mizutani et al. discloses an optical semiconductor apparatus including a substrate, a first region formed on the substrate, a second region formed on the substrate, and a stimulating unit. The first region includes a first waveguide which extends in a light propagation direction and is constructed so as to permit light waves in two different polarization modes to be propagated in the propagation direction. The first waveguide contains a first active region which is constructed such that a gain for one of the different polarization modes is dominant. The second region includes a second waveguide which extends in the propagation direction, is coupled to the first waveguide and is constructed so as to permit light waves in the different polarization modes to be propagated in the propagation direction. The second waveguide contains a second active region which is constructed such that a gain for the other of the different polarization modes is dominant. At least one of the first and second active regions includes a first active layer, in which a gain for one of the different polarization modes is dominant, and a second active layer, in which a gain for the other of the different polarization modes is dominant. The stimulating unit stimulates the first and second active regions independently from each other.

Mizutani et al. fails to disclose that the active layer contains quantum dots, quantum wires or quantum dashes, as recited in claims 1 and 3 of the instant application. (**Mizutani et al.** discloses only that element 81, which arguably may look like a quantum dot structure, is a diffraction grating.)

O'Brien et al. discloses a differentially patterned pumped optical semiconductor gain medium comprising an optical semiconductor device which is differentially pumped and a master

oscillator power amplifier (MOPA) device employing such an amplifier. The gain medium may have a linear stripe region or a diverging stripe region that allows the light propagating therein to diverge along at least part of its length, such as a flared or tapered amplifier having a gain region that increases in width toward its output at a rate that equals or exceeds the divergence of the light. The amplifier is pumped with a current density at its input end which is smaller than the current density used to pump the output end for maintaining coherence of the beam to high power levels amplifying differential pumping. Differential pumping may be both longitudinal and lateral within the amplifier and may be patterned to reduce the peak modal gain observed longitudinally along and/or laterally across the pumped stripe region of the gain medium so that the experienced modal gain of the propagating light is more balanced along the length of the stripe region, i.e., rendered significantly more uniform in distribution, providing for higher diffraction limited performance without optical filamentation formation.

Like **Mizutani et al.**, **O'Brien et al.** fails to disclose quantum dots, quantum wires or quantum dashes, as claimed in the instant application.

Nitta et al. discloses an optical amplifier device having such a structure that exhibits a both-end voltage change at an optical amplification time of an input light. The detector detects the both-end voltage change, and the controller performs a predetermined control of a portion other than the optical amplifier device, such a another optical amplifier portion and a tunable band pass filter portion.

Nitta et al. also fails to disclose quantum dots, quantum wires or quantum dashes, as claimed in the present invention.

Ikeda et al. discloses a semiconductor laser device usable as a tunable laser, optical amplifier, optical wavelength converter and the like, and includes a plurality of light emitting layers, a barrier layer formed between the light emitting layers, a pair of light-electron confinement layers for sandwiching the light emitting layers and the barrier layer. Band gaps of ground levels of the light emitting layers are different from each other, a band gap of the barrier layer is larger than those of the light emitting layers and band gaps of the light-electron confinement layers are different from each other. Further, the light emitting layers, the barrier layer and the light-electron confinement layers are formed such that, when carriers are injected into the light emitting layers, a carrier density of the light emitting layer having a larger band gap is made higher and a carrier density of the light emitting layer having a smaller band gap is made lower than at least one of cases where the barrier layer is omitted and where a pair of the light-electron confinement layers are symmetrically formed with respect to the light emitting layers.

Ikeda et al. fails to disclose the quantum dots, quantum wires or quantum dashes claimed in the instant application.

The devices disclosed in the references discussed above each have an active layer comprising a quantum well, but do not have the active layer that contains quantum dots, quantum wires or quantum dashes. The optical amplifier having the active layer comprising the quantum well has a gain corresponding to the wetting layer "Wet" shown in FIG. 13 of the present application, but does not have a gain corresponding to "Gnd," "2nd" and "Upper." Namely, the optical amplifier does not have a gain in a wavelength range longer than 1250 nm. Accordingly, the optical amplifier can amplify optical signals in a wavelength rage between 1100 nm and 1250

nm, the width of which is only 150 nm. Therefore, the optical amplifier cannot be used as a multi-channel optical amplifier.

In contrast, the optical amplifier of the instant application having the active layer containing quantum dots can amplify optical signals in a wavelength range between 1300 nm and 1600 nm, the width of which is about 300 nm. In the result, the optical amplifier of the instant application may be used as an 8-channel optical amplifier, as shown in FIG. 13 of the instant application.

The claimed invention can solve the problem that channels vary in gain. This problem does not exist in the devices of the cited references because the optical amplifiers disclosed therein cannot be used as multi-channel optical amplifiers. The present invention thus has an unexpected result of solving the above problem.

Thus, the 35 U.S.C. § 102(b) rejection should be withdrawn.

Claims 2, 4, 5 and 6 stand rejected under 35 U.S.C. § 102(b) as anticipated by **Ikeda et al.**

Applicant respectfully traverses this rejection.

First, the Examiner has referred to currents I_{a1}, I_{a2} and I_D, which are shown in FIG. 20 of **Nitta et al.** Thus, this rejection must be based on **Nitta et al.**, instead of **Ikeda et al.**

Second, the Examiner mentions the case where $I_{a1}=I_{a2}\neq I_D$. Column 12, lines 1-14 disclose "first or second general amplifying regions into which an injection current I_{a1} 121 or I_{a2} 122 is injected " (emphasis added). There is no disclosure in **Nitta et al.** of any case where $I_{a1}=I_{a2}\neq I_D$. Thus, **Nitta et al.** fails to disclose that only two groups are provided (as recited in claim 5) and

that current is supplied to electrodes for a plurality of sections belonging to only two groups, where each section belonging to the same group has the same current density (claim 3).

Furthermore, **Nitta et al.** fails to teach, mention or suggest the limitations of claims 1 and 3, from which these claims depend.

Thus, the 35 U.S.C. § 102(b) rejection should be withdrawn.

In view of the aforementioned amendments and accompanying remarks, claims 1-10, as amended, are in condition for allowance, which action, at an early date, is requested.

If, for any reason, it is felt that this application is not now in condition for allowance, the Examiner is requested to contact Applicant's undersigned attorney at the telephone number indicated below to arrange for an interview to expedite the disposition of this case.

In the event that this paper is not timely filed, Applicant respectfully petitions for an appropriate extension of time. Please charge any fees for such an extension of time and any other fees which may be due with respect to this paper, to Deposit Account No. 01-2340.

Respectfully submitted,

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Enclosures: Replacement Drawing FIG. 4
Petition for Extension of Time
Amendment Transmittal
Check in the amount of $650.00

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